COLLEGE OF ENGINEERING | THE UNIVERSITY OF UTAH

Department of Chemical Engineering

UNDERGRADUATE STUDENT GUIDE

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I. What is Chemical Engineering?

A chemical engineer applies chemical and engineering knowledge to several fields—environmental protection, pollution prevention, biotechnology, electronics, petroleum, medicine, and law. Chemical engineers are involved in research, development (taking a process from bench scale to full scale), design and evaluation (how should the process work), plant design (how should the chemical plant be built), plant operation, sales, management, and academics.

Chemical engineers are responsible for making useful products from raw materials. They have developed the synthetic rubber used for tires, translated laboratory breakthroughs in the drug industry to large-scale, low-cost production facilities, and changed daily life with the development of plastics and synthetic fabrics. Chemical engineers in the fertilizer industry are helping in the fight against world hunger. The chemical engineer is flexible, and possesses a fundamental background and a highly developed ability to analyze and solve new problems. This training and knowledge enable the chemical engineer to enter entirely new areas of research and development with success. The chemical engineering profession is moving into several nontraditional areas that require engineers to have an even broader background in chemistry, mathematics, physics, and biology. These areas include biotechnology and biomedicine; electronic, photo optic, and recording materials and devices; and microstructured materials such as ceramics, polymers, and composites. Each of these specialties utilize chemical engineering principles and expertise to provide better health, improve the environment, develop more efficient chemical production methods, and fabricate new materials.

Every chemical engineer is an environmental engineer and a process safety engineer. Our graduates must regularly consider the safety and environmental consequences of the production and use of chemical, biological, forest and food products, and of fuels and power. Many chemical engineers work in environmental control agencies and in consulting and control firms. Interested chemical engineering undergraduates may choose to specialize in environmental engineering and satisfy their B.S. Chemical Engineering elective requirements by taking courses in environmental engineering (see the section below on Technical Electives).

Unlimited opportunities for development of interests in either scientific or applied pursuits are offered in the chemical engineering field. Chemical engineers are vital players in improving our standard of living and initiating social change. Employment opportunities for our graduates are excellent, and salaries are among the highest for B.S. engineers.

II. Welcome and General Information

It is our pleasure to welcome you to the University of Utah and to our Department. We hope that your first year will be an exciting and rewarding experience for you. This guide is designed to answer most of your questions regarding the policies and procedures of the University and the Department. We also recommend that you make an appointment with an advisor in Chemical Engineering so that you can plan your education and understand the requirements. Our advisors are listed below.

Advisor	Telephone	E-mail
Megan McAllister	585-7175	megan.mcallister@utah.edu
Geoff Silcox	581-8820	geoff@chemeng.utah.edu

You can also find answers using the web sites listed below.

University of Utah	http://www.utah.edu
College of Engineering	http://www.coe.utah.edu
Department of Chemical Engineering	http://www.che.utah.edu

The Bachelor of Science Degree in Chemical Engineering at the University of Utah is accredited. In the 2015-2016 accreditation cycle, the Chemical Engineering Program was granted the NGR (Next General Review) Status by the Engineering Accreditation Commission of ABET, www.abet.org.

There are many opportunities for undergraduate student to interact directly with the faculty, both inside and outside of class. The Department provides an excellent undergraduate and graduate-level education. The department's faculty have diverse research interests, are internationally known for their engineering, teaching, and scientific contributions, and some have extensive industrial experience.

Research is an important part of the department and offers the undergraduate student an opportunity to work individually with a professor on a specific engineering problem. This can be done as either a H.B.S. senior thesis, or as part of the University's Undergraduate Research Program. Much of the research that is performed in the department reflects the strengths of the broader industrial and academic community in Utah. Interests include energy and fuels, environmental, engineering education, biological and biomedical engineering, multi-scale simulation, nano-materials and technology, catalysis and reaction engineering, interfacial science, and process control.

The department participates in several university research centers that enable students to collaborate with other students and professors throughout campus on interdisciplinary problems.

Mission

The mission of the Department of Chemical Engineering is to graduate high quality chemical engineers, perform and disseminate groundbreaking research, and provide service to the profession and community at large.

Objectives

The department and its constituencies have developed the following educational objectives. The objectives describe the career and professional accomplishments that the program is preparing graduates to achieve.

1) Graduates will contribute to their profession and succeed in their chosen careers.
2) Graduates will continue to expand their knowledge and capabilities.
3) Graduates will be aware of issues that affect society and the world and will use this knowledge to strengthen their profession and contribute to the well-being of society.
4) Graduates will work effectively with others, practice ethical decision making, and promote a culture of safety.

III. Admission Policy

All students are encouraged to meet with a departmental advisor to review program requirements and to ensure understanding of what is needed to make satisfactory progress toward degree completion. Initial meetings with an advisor often occur as part of the University's orientation program. The program requirements are summarized in the Undergraduate Student Handbook. It is available on the web (http://www.che.utah.edu/undergraduate/academic_program.php) and in hardcopy.

MAJOR STATUS

Students with and without transfer credit, who are admitted to the U of U, will be admitted to Chemical Engineering with major status provided that they meet the requirements for registering in CH EN 1703, Introduction to Chemical Engineering, as they appear in the current edition of the General Catalog. The 2017-2018 requirements are, “Corequisites: C or better in ((MATH 1210 OR 1310 OR 1311 OR 1220 OR 1320 OR 1321) AND (CHEM 1210 OR AP CHEM score of at least 4)”.

Students who are awarded major status will be eligible for an account on the Chemical Engineering computer network. Please contact Megan for more information (megan.mcallister@utah.edu).

To keep major status, Chemical Engineering students need to maintain an overall U of U GPA of at least 2.5. Students who lose major status will be able to request a permission code in order to repeat courses. The granting of permission codes will be decided by the Undergraduate Committee. Students who lose major status will have at most two semesters to raise their overall GPA to 2.5 or higher.

IV. Students with Disabilities

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the Chemical Engineering Program, reasonable prior notice needs to be given to the Center for Disability Services (CDS), http://disability.utah.edu/, 162 Olpin Union Building, 581-5020. CDS will work with you and your instructors to make arrangements for accommodations. All written information in your

courses can be made available in alternative format with prior notification to the Center for Disability Services.

V. Degree Requirements

In order for a student to obtain a B.S. degree in Chemical Engineering at the University of Utah, he or she must satisfy the University-wide degree requirements and the Departmental degree requirements. The University of Utah degree requirements are stated in the *General Catalog*. Many of these requirements are fulfilled through the departmental requirements. The departmental requirements are listed below and many of these are explained in detail in the following sections.

1. Completion of the course requirements listed under the departmental program of study below that includes the minimum number of Undergraduate Seminar courses (4) and the required technical elective credits (15). All required courses, including those taken to satisfy technical elective requirements, must be taken for letter-grade credit.
2. The semester in which you first register for CH EN 1703 sets the catalog year for the handbook that governs your graduation requirements. The catalog year for a transfer student is set by the semester in which he or she started at the University of Utah, provided he or she meets the corequisite requirements for CH EN 1703. The catalog year appears on the front cover of this Undergraduate Student Handbook.
3. The University of Utah requires a minimum of 122 semester hours for a bachelor's degree of which 40 must be 3000 level or above. The program of study for a B.S. degree in Chemical Engineering requires 127 semester hours with well over 40 semester hours in the 3000 level or above category.
4. Satisfactorily completing the General Education and Bachelor's Degree Requirements for the University. The University has a Lower Division Writing requirement that is normally filled by completing Writing 2010 with a grade of C- or better, and an Upper-Division Communications/Writing requirement, which is normally filled by completing CH EN 4905. The Quantitative Reasoning requirement (QA and QB) can be satisfied with Calculus. The two B.S. Quantitative Intensive classes (QI) are normally filled by completing the required chemical engineering and chemistry classes. Students are responsible for fulfilling the Diversity requirement, the American Institutions requirements, the Intellectual Explorations requirements, and the International Requirement. There are four classes that will fulfill both the International Requirement and a technical elective requirement: ECON 3500, MGT 4900, MKTG 4840, and PHYS 3150.
5. Meeting the University's residency requirement: of the total hours for graduation, at least 30 must be earned in courses taken in residence at the University (correspondence courses, courses earned by exam or petition do not count). Twenty of the student's last 30 hours must be earned in residence at the University.
6. Degree candidates must have a minimum cumulative GPA of 2.5 Transfer GPA is not combined with U of U GPA for this requirement. All courses must be taken for letter grades, with the exception of Undergraduate Seminar, CH EN 4753, 4755, and other courses that are only available on a credit/no-credit basis.

7. The minimum acceptable grade for a required course, including science, math, and technical electives, is "C". This requirement includes transfer credit. General education courses will not be included in this requirement. Failure to earn at least a "C" will prevent students from registering for subsequent Chemical Engineering courses.
8. When a College of Engineering class is taken more than once, only the grade for the second attempt is counted. Grades of W, I, or V on a student's record count as having taken the class. Chemical Engineering also enforces these guidelines for mathematics and science courses. If a course is taken at the University of Utah and subsequently repeated at another institution, the grade from that second attempt will not replace the prior grade from the University of Utah. After two unsuccessful attempts of any required math, science or engineering course, students will be dismissed from the Chemical Engineering Major.
9. In order to graduate, students must take the Fundamentals of Engineering (FE) CHEMICAL CBT Exam. The exam is administered by the State and is nationally composed and graded. This exam is given throughout the year and should be taken at the earliest possible date in the senior year or at the end of the junior year. Students who do not pass the FE exam after two attempts are still allowed to graduate as described later in this handbook.
10. Transfer students are not required to complete CH EN 1705, Chemical Engineering Design & Innovation, provided they have completed the physics labs (PHYS 2215, 2225) and the organic chemistry lab (CHEM 2315). Transfer students who have not completed these labs elsewhere may take them at the University of Utah. Note that at the University of Utah, PHYS 1809 can replace PHYS 2215 and 2225. A transfer student is defined as someone who has completed 2/3 of their first-year requirements at another school.
11. Completion of the senior exit interview is a requirement for graduation. This is enforced through DARs by making participation in the Senior Exit Interview a graduation requirement.
12. Students who are twice found to have engaged in academic misconduct, as defined in the Student Code, in Chemical Engineering courses, and who have exhausted their appeals, as described in the Student Code, will have their major status revoked; they will not be allowed back into the Chemical Engineering program and will not be able to request permission codes.

Departmental Program of Study

The Departmental Four Year Program of Study is listed on page 8. Although some students are able to complete the necessary course work in four years, some of our students do not, primarily because of other commitments, such as family and work. We have included a Five Year Program as a guide for those students on page 10. To avoid unnecessary loss of time, the student should make sure the prerequisites indicated under course descriptions in the University General Catalog are completed prior to the time the courses are taken. Note that the minimum acceptable grade in required chemical engineering courses is C and that the minimum acceptable grade in required mathematics courses is C.

FOUR-YEAR PROGRAM IN CHEMICAL ENGINEERING 2017-2018 Catalog Year

FIRST YEAR	
FALL SEMESTER	SPRING SEMESTER
MATH 1310 or 1311 Eng Calculus I[1] (4)	MATH 1320 or 1321 Eng Calculus II[1] (4)
CHEM 1210 General Chemistry I (4)	CHEM 1220 General Chemistry II[2] (4)
CHEM 1215 General Chemistry Lab I (1)	CHEM 1225 General Chemistry Lab II (1)
WRTG 2010 Intermediate Writing (3)	PHYS 2210 Phycs For Scien & Eng I (4)
CH EN 1703 Intro to Chem Eng (2)	CH EN 1705 ChemE Design & Innov[3] (3)
General Education/Bachelor Req (3)	CH EN 4755 Undergraduate Seminar (0.5)
TOTAL HOURS: 17	TOTAL HOURS: 16.5
SECOND YEAR	
FALL SEMESTER	SPRING SEMESTER
MATH 2250 Diff Equ & Lin Algebra (4)	MATH 3140 Vector Calc and PDE's (4)
PHYS 2220 Phycs For Scien & Eng II (4)	CH EN 2800 Fund. of Process Eng (3)
CH EN 2300 Thermodynamics I (2)	CHEM 2310 Organic Chemistry I[4] (4)
CH EN 2450 Numerical Methods (2)	General Education/Bachelor Req (3)
CH EN 4753 Undergraduate Seminar (0.5)	Technical Elective (3)
General Education (3)	TOTAL HOURS: 17
TOTAL HOURS: 15.5	
THIRD YEAR	
FALL SEMESTER	SPRING SEMESTER
CHEM 3060 Quantum Chem (4)	CH EN 3253 Chemical Process Safety (3)
CH EN 3353 Fluid Mechanics (3)	CH EN 3255 Communication & Safety (1)
CH EN 3453 Heat Transfer (3)	CH EN 3603 Mass Transfer Separations (3)
CH EN 3853 Chemical Eng Thermo (3)	CH EN 3553 Chemical Reaction Eng (3)
CH EN 4753 Undergraduate Seminar (0.5)	CH EN 5103 Biochemical Engineering (3)
Technical Elective[5] (3)	General Education/Bachelor Req (3)
TOTAL HOURS: 16.5	TOTAL HOURS: 16
FOURTH YEAR	
FALL SEMESTER	SPRING SEMESTER
CH EN 4903 Projects Laboratory I (4)	CH EN 4905 Projects Laboratory II[6] (3)
CH EN 4253 Process Design I (3)	CH EN 5253 Process Design II (3)
CH EN 4203 Process Control (3)	Technical Elective (6)
CH EN 4753 Undergraduate Seminar (0.5)	
or CH EN 4850 FE Review (0.5)	
Technical Elective (3)	
General Education/Bachelor Req (3)	TOTAL HOURS: 12
TOTAL HOURS: 16.5	
GRAND TOTAL HOURS: 127	

1. Qualified students may wish to take the MATH 1311 and 1321, Accelerated Eng Calc series, in place of MATH 1310 and 1320.
2. Qualified students may wish to take CHEM 1221, Honors Gen Chem II and CHEM 1241, Honors Gen Chem Lab II, instead of CHEM 1220, Gen Chem II, and CHEM 1225, Gen Chem Lab II.
3. CH EN 1705 is a required course. Transfer students are encouraged to complete 1705. If they do not, they are required to replace it with PHYS 1809 (Elementary General Physics Laboratory) and CHEM 2315 (Organic Chemistry Lab I). Note that PHYS 1809 can be replaced by PHYS 2215 and 2225 (Physics Laboratory for Scientists

and Engineers I & II). A transfer student is defined as someone who has completed 2/3 or more of their first-year requirements at another school. If 1705 is replaced by physics and chemistry labs as described above, those labs may not be used as technical electives.
4. Students who qualify may wish to take CHEM 2311, Honors Organic Chemistry I, instead of CHEM 2310.
5. A total of 15 credit hours of technical elective courses are required.
6. CH EN 4905 fulfills the Upper-Division Writing/Communication requirement.

FIVE-YEAR PROGRAM IN CHEMICAL ENGINEERING 2017-2018 Catalog Year

FIRST YEAR	
FALL SEMESTER	SPRING SEMESTER
MATH 1310 or 1311 Eng Calculus I[1] (4)	MATH 1320 or 1321 Eng Calculus II[1] (4)
CHEM 1210 General Chemistry I (4)	CHEM 1220 General Chemistry II[2] (4)
CHEM 1215 General Chemistry Lab I (1)	CHEM 1225 General Chemistry Lab II (1)
WRTG 2010 Intermediate Writing (3)	PHYS 2210 Phycs For Scien & Eng I (4)
CH EN 1703 Intro to Chem Eng (2)	CH EN 1705 ChemE Design & Innov[3] (3)
	CH EN 4755 Undergraduate Seminar (0.5)
TOTAL HOURS: 14	TOTAL HOURS: 16.5
SECOND YEAR	
FALL SEMESTER	SPRING SEMESTER
MATH 2250 Diff Equ & Lin Algebra (4)	CH EN 2800 Fund. of Process Engineering (3)
PHYS 2220 Phycs For Scien & Eng II (4)	CHEM 2310 Organic Chemistry I[4] (4)
CH EN 2450 Numerical Methods (2)	CH EN 4755 Undergraduate Seminar (0.5)
CH EN 2300 Thermodynamics I (2)	General Education/Bachelor Req (3)
	Technical Elective (3)
TOTAL HOURS: 12	TOTAL HOURS: 13.5
THIRD YEAR	
FALL SEMESTER	SPRING SEMESTER
MATH 3140 Vector Calc and PDE's (4)	CHEM 3060 Quantum Chem (4)
CH EN 3353 Fluid Mechanics (3)	General Education/Bachelor Req (6)
CH EN 3853 Chemical Eng Thermo (3)	
General Education/Bachelor Req (3)	
TOTAL HOURS: 13	TOTAL HOURS: 10[6]
FOURTH YEAR	
FALL SEMESTER	SPRING SEMESTER
CH EN 3453 Heat Transfer (3)	CH EN 3253 Chemical Process Safety (3)
Technical Elective[5] (6)	CH EN 3255 Communication & Safety (1)
CH EN 4753 Undergraduate Seminar (0.5)	CH EN 3553 Chemical Reaction Eng (3)
General Education/Bachelor Req (3)	CH EN 3603 Mass Transfer & Separations (3)
	CH EN 5103 Biochemical Engineering (3)
TOTAL HOURS: 12.5	TOTAL HOURS: 13
FIFTH YEAR	
FALL SEMESTER	SPRING SEMESTER
CH EN 4903 Projects Laboratory I (4)	CH EN 4905 Projects Laboratory II[7] (3)
CH EN 4203 Process Control (3)	CH EN 5253 Process Design II (3)
CH EN 4253 Process Design I (3)	Technical Elective[5] (3)
CH EN 4753 Undergraduate Seminar (0.5)	
or CH EN 4850 FE Review (0.5)	
Technical Elective[5] (3)	
TOTAL HOURS: 13.5	TOTAL HOURS: 9[6]
GRAND TOTAL HOURS: 127	

1. Students with adequate math preparation may wish to take the MATH 1311 and 1321, Accelerated Engineering Calculus series, in place of MATH 1310 and 1320.
2. Students who qualify may wish to take CHEM 1221, Honors General Chemistry II and CHEM 1241, Honors General Chemistry Lab II, instead of CHEM 1220, General Chemistry II, and CHEM 1225, General Chem Lab II.
3. CH EN 1705 is a required course that was first offered spring semester 2013. Transfer students are encouraged to complete 1705. If they do not, they are required to replace it with PHYS 1809 (Elementary General Physics Laboratory) and CHEM 2315 (Organic Chemistry Lab I). Note that PHYS 1809 can be replaced by PHYS 2215 and 2225 (Physics Laboratory for Scientists and Engineers I & II). A transfer student is defined as someone who has completed 2/3 of their first-year requirements at another school. If 1705 is replaced by physics and chemistry labs as described above, those labs may not be used as technical electives.
4. Students who qualify may wish to take CHEM 2311, Honors Organic Chemistry I, instead of CHEM 2310.
5. A total of 15 credit hours of technical elective courses are required.
6. Note that a student must take at least 12 credit hours to be considered a full-time student, a requirement for scholarship recipients. You may have to take an additional course to bring your total credit hours up to 12 for this semester.
7. CH EN 4905 fulfills the Upper-Division Writing/Communication requirement.

Some factors to be considered in planning your course work are

- Table 1 lists the prerequisite for required classes. The Department's policy on prerequisites is given on p. 26 of this guide.
- Chemistry 1220 and CH EN 2300 are prerequisites to Chemical Engineering 2800.
- Upper- and lower-division chemical engineering courses may be offered only once each year and are restricted to students who have met the prerequisites.

Undergraduate Seminar

All chemical engineering candidates must take at least 2.0 credit hours of undergraduate seminar (CH EN 4753, 4755 - 0.5 credit hours each) during their tenure. This seminar course, which is offered every semester for 0.5 credit hours, meets once a week and is designed to discuss topics in chemical engineering. It is organized by the instructor and by the Student Chapter of AIChE and provides useful information about the chemical engineering profession, employment opportunities, and student organizations. The Student Chapter organizes tours of local industries. Students may substitute CH EN 4859 (FE Review) for one semester of Undergraduate Seminar.

Table 1. Prerequisites for Courses Required by the Chemical Engineering Department.

Year / Semester	Course (Department, Number, Title)	Prerequisites	Coreq	Minimum Grade in Requisites
Year 1/Fall	MATH 1310 Eng Calculus I	MATH 1050, 1060 or 1080		C
Year 1/Fall	CHEM 1210 Gen Chem I	MATH 1050		C
Year 1/Fall	CHEM 1215 Gen Chem Lab I		CHEM 1210	C
Year 1/Fall	CH EN 1703 Intro Chemical Eng		MATH 1310, CHEM 1210	C
Year 1/Spring	MATH 1320 Eng Calculus II	MATH 1310		C
Year 1/Spring	CHEM 1220 Gen Chem II	CHEM 1210		C
Year 1/Spring	CHEM 1225 Gen Chem Lab II	CHEM 1215	CHEM 1220	C
Year 1/Spring	PHYS 2210 Physics for Sci & Eng I	MATH 1310		C
Year 1/Spring	CH EN 1705 Des and Innov in ChemE	MATH 1310, CH EN 1703, major status in CH EN		C
Year 2/Fall	MATH 2250 Diff Eq and LA	MATH 1320		C
Year 2/Fall	PHYS 2220 Physics for Sci & Eng II	MATH 1320, PHYS 2210		C
Year 2/Fall	CH EN 2300 Thermo I	PHYS 2210, MATH 1320, major status in CH EN		C
Year 2/Fall	CH EN 2450 Num Methods	CH EN 1703, major status in CH EN	MATH 2250	C
Year 2/Spring	MATH 3140 Vect Calc and PDEs	MATH 2250, 1320		C
Year 2/Spring	CH EN 2800 Fund of Process Eng	CHEM 1220, CH EN 2300, major status in CH EN		C
Year 2/Spring	CHEM 2310 Organic Chem I	CHEM 1220		C
Year 3/Fall	CHEM 3060 Quantum Chem	CHEM 1220, PHYS 2220, MATH 2250		C
Year 3/Fall	CH EN 3353 Fluid Mechanics	MATH 2250, PHYS 2220, CH EN 2300, 2450, 2800, major status in CH EN		C
Year 3/Fall	CH EN 3453 Heat Transfer	MATH 2250, PHYS 2220, CH EN 2300, 2450, 2800, major status in CH EN		C
Year 3/Fall	CH EN 3853 Chemical Eng Thermo	MATH 2250, PHYS 2220, CH EN 2300, 2450, 2800, major status in CH EN		C
Year 3/Spring	CH EN 3253 Chem Process Safety	CH EN 3353, 3453, 3853, major status in CH EN	CH EN 3553, 3603	C
Year 3/Spring	CH EN 3255 Communication & Safety		CH EN 3253	
Year 3/Spring	CH EN 3603 Mass Transfer and Sep	CH EN 3353, 3453, 3853, major status in CH EN		C
Year 3/Spring	CH EN 3553 Chem Reaction Eng	CH EN 3353, 3453, 3853, major status in CH EN		C
Year 3/Spring	CH EN 5103 Biochem Eng	Major status in CH EN	CH EN 3553, 3603	C
Year 4/Fall	CH EN 4903 Projects Lab I	CH EN 3603, 3553, 5103, major status in CH EN	CH EN 4203	C
Year 4/Fall	CH EN 4253 Process Design I	CH EN 3603, 3553, major status in CH EN		C
Year 4/Fall	CH EN 4203 Process Control	CH EN 3603, 3553, major status in CH EN		C
Year 4/Spring	CH EN 4905 Projects Lab II	CH EN 4903, major status in CH EN		C
Year 4/Spring	CH EN 5253 Process Design II	CH EN 4253, 4903, major status in CH EN		C

Emphasis in Energy Engineering

Three of the major challenges facing humanity are limitations in the supplies of food, water, and energy. The emphasis in energy engineering is meant to give undergraduates in Chemical Engineering a suite of technical electives that will equip them with the engineering and professional skills required to address the need for clean and secure energy. Environmental protection, energy use, and energy production are included in the emphasis. The emphasis will appear on students' transcripts.

The emphasis requires 15 units and this requirement fits within the current requirement of 15 hours of technical electives in Chemical Engineering. The core electives are listed below. Students will complete 9 units from these four courses.

Core Classes for Emphasis in Energy Engineering (9 units required)		
Course	Title	Units
CH EN 5151	Combustion Engineering (not taught every year)	3
CH EN 5153	Fundamentals of Combustion (not taught every year)	3
CH EN 5158	Energy and Society	3
CH EN 5305	Air Pollution Control Engineering	3
CH EN 5310	Renewable Energy	3

Students will complete 6 units of supporting courses that provide a broad overview of energy related topics including climate change, sustainability, geology, and statistics. The supporting courses also include nuclear engineering and the design of thermal systems for power plants. Please note the prerequisites and co-requisites that are included below.

Supporting Classes for Emphasis in Energy Engineering (6 units required)			
Course	Title	Units	Prerequisites and Comments
ATMOS 5400	The Climate System	3	MATH 1050
ECE 2210	Electrical and Computer Engineering for Non-majors	3	PHYS 2210 with MATH 2250 as a co-requisite
ECE 3600	Introduction to Electric Power Engineering	3	ECE 2210
GEO 5220	Seismology II: Exploration and Engineering Seismology	3	Recommended: GEO 5210 and 5320
GEO 5240	Physical Fields II: Electrical Methods	3	Recommended: MATH 3150 and PHYCS 2220
GEO 5370	Contaminant Partitioning for Scientists & Engineers	3	CHEM 1210, 1220
GEO 5390	Solute Transport and Subsurface Remediation	3	GEO 3080, 3090, 3400, 5350, 5360, 5370, 5385, 5500 or instructor's consent.
GEO 5690	Aqueous Geochemistry for Engineers & Scientists	3	CHEM 1210, 1220
GEO 5760	Stratigraphy and Sedimentary Processes	4	GEO 3090. Recommended: GEO 3060.
GEO 5920	Special Topics in Fundamentals of Applied Earth Science	1.5	Instructor's consent.
MATH 3070	Applied Statistics	4	MATH 1311 or 1320
MATH 5600	Survey of Numerical Methods	4	MATH 1321 and 2250
ME EN 5800	Sustainable Energy Engineering	3	CH EN 2300, 3453, instructor's consent
ME EN 5810	Thermal Systems Design	3	CH EN 2300, 3453, instructor's consent
NUCL 3000	Nuclear Principles in Engineering and Science	3	PHYS 2220, CHEM 1220, MATH 1320
NUCL 4000	Nuclear Engineering and Science Using the TRIGA	3	NUCL 3000, 3100
NUCL 5100	Reactor Physics	3	NUCL 3000, 3100
PHYS 3150	Energy and Sustainability: A Global Perspective	3	Fulfills IR. MATH 1310, PHYS 2210

Technical Electives

Bachelor's degree candidates must complete15 hours of approved technical electives. At least six of the 15 hours must be upper division chemical engineering classes (CH EN) or approved upper division nuclear engineering classes (NUCL). Table 2 lists the approved classes for technical electives in Chemical Engineering and Nuclear Engineering. Table 3 lists approved courses in other majors. **Although not required, students may choose to take most of their electives in one specialty**. Approved courses, listed by specialty, are given in Table 4. A brief description of the various specialties is given in Table 5. A student needs to petition the faculty, through the Undergraduate Committee (contact the Chair, Geoff Silcox), if she or he wants to use a course not listed in Tables 2 and 3 as a technical elective. Students are responsible for completing any prerequisites or co-requisites for technical elective classes.

Students who are interested in biochemical engineering and living systems are allowed to petition the Undergraduate Committee (contact the Chair, Geoff Silcox) for an exception to the above policy. The petition process allows up to 3 of the required CH EN hours to be replaced by other approved electives.

Table 2. Approved classes for technical electives in CH EN and NUCL Classes *

Course	Title	Hours	Prerequisite(s)
CH EN 4973	Undergraduate Thesis	1 - 3	Instructor's consent
CH EN 4975	Chemical Engineering Clinic	1 – 3	Instructor's consent
CH EN 4977**	Co-op	1 – 3	Instructor's consent Up to 3 hours as upper division CH EN
CH EN 4980	Undergraduate Research	3	Instructor's consent
CH EN 4999	Honors Thesis	3	Instructor's consent
CH EN 5151	Combustion Engineering	3	CH EN 3353, 3453, major status
CH EN 5153	Fundamentals of Combustion	3	CH EN 3603, 3553, major status
CH EN 5158	Energy and Society	3	CH EN 2300, 2800, major status
CH EN 5203	State Space Methods	3	CH EN 4203, major status
CH EN 5xxx	Smart Systems	3	CH EN 3353, 3453, major status
CH EN 5305	Air Pollution Control Engineering	3	CH EN 2300, 2800, major status
CH EN 5310	Renewable Energy	3	CH EN 2300, 2800, major status
CH EN 5810	Nanoscience	3	CHEM 1220, PHYS 2220
CH EN 5950	Independent Study	1 – 5	Instructor's consent
CH EN 5960	Special Topics	3	Instructor's consent
NUCL 3000***	Nuclear Principles in Engineering & Science	3	Calculus I & II, first year chemistry and physics
NUCL 3100	Introduction to Neutron-Based Engineering	3	NUCL 3000
NUCL 3200	Radiochemistry with Laboratory I	3	First year chemistry and physics courses
NUCL 4000	Nuclear Engineering & Science Using TRIGA	3	NUCL 3000, 3100

*Students who are interested in biochemical engineering and living systems are allowed to petition the Undergraduate Committee (contact the Chair, Geoff Silcox) for an exception to this policy. The petition process allows up to 3 of the required 6 CH EN hours to be replaced by other approved electives in the biochemical or living systems areas.

**Students who register for CH EN 4977 can receive up to 3 units of chemical engineering elective credit. Students who register for CH EN 4978 can receive up to 3 units of non-departmental elective credit. The total credit hours awarded to 4977 and 4978 cannot exceed 6 units.

***A minor in Nuclear Engineering is available. See http://www.nuclear.utah.edu/minor.html.

Table 3. Approved Non-CH EN and NUCL Technical Electives

Course	Title	Semester Hours	Prerequisite(s)
ATMOS 5000	Introduction to Atmospheric Science	3	MATH 1220 and PHYS 2210
BIOL 2020	Principles of Cell Biology	3	BIOL 1210 and 2010, CHEM 1210
BIOL 2030	Genetics	3	BIOL 2020
BIOL 3510	Biological Chem I	3	BIOL 2020 and 2030, CHEM 2320
BIOL 3520	Biological Chem II	3	BIOL 3510 or CHEM 3510
BIOL 5495	Biophysical Ecology	4	BIOL 2010, CHEM 1220, MATH 1220, PHYS 2210
CHEM 2315	Organic Chemistry Laboratory I	2	Co-requisite CHEM 2310
CHEM 2320	Organic Chemistry II	4	CHEM 2310 *May take CHEM 2320 or 2321, not both*
CHEM 2321	Honors Organic Chemistry II	4	CHEM 2311 *May take CHEM 2320 or 2321, not both*
CHEM 2325	Organic Chemistry Laboratory II	1	Co-requisite CHEM 2320 or 2321
CHEM 3070	Thermodynamics and Chemical Kinetics	4	MATH 2210, PHYS 2220 and CHEM 1220 or 1221
CHEM 3090	Physical Chemistry for Life Sciences	4	MATH 2210 and PHYS 2220 and CHEM 1220 or 1221
CHEM 3100	Inorganic Chemistry	5	CHEM 1220
CHEM 5720	Adv. Physical Chemistry Lab	2	CHEM 3060
CHEM 5730	Adv. Inorganic Chemistry Lab	2	
CH EN 4978*	Co-op	1 – 3	Instructor's consent *Up to 3 hours as non-ChE elective**
CMP 5350	Public Lands and Environ. Policy	3	*May take POL S 5322 or CMP 5350, not both*
CMP 5360	Environ. Planning Law & Policy	3	

CS 1410	Object-Orient Prog	4	Instructor's consent
CS 3200	Intro Scientific Comp	3	CS 1410
CVEEN 3610	Intro. to Environ. Engineering I	3	CHEM 1220, CH EN 3353
CVEEN 5605	Water Treatment Design	3	CVEEN 3610
ECE 2210	ECE for Nonmajors	3	PHYS 2210, MATH 2250
ECON 3500	International Economics	3	ECON 2010 and 2020 (or ECON 1010 and instructor's consent) Fulfills IR
ENTP 3700	Fundamentals of Entrepreneurship	3	Instructor consent
ENTP 4560	Small Business Management	3	none
ENTP 5770	Business Discovery	3	C- or better in MGT 5000 & Major or Minor Status in Business
ENTP 5780	Managing the Growing Business	3	Major or Minor Status in Business
GEO 5350	Groundwater	3	MATH 1220
MATH 3070	Applied Statistics I	4	MATH 1220, 1250, or 1270
MATH 3080	Applied Statistics II	3	MATH 3070
MATH 3170	R Lab I	1	corequisite: MATH 3070
MATH 3180	R Lab II	1	corequisite: MATH 3080
MATH 5600	Survey of Numerical Analysis	4	MATH 2210, 2250
MATH 5620	Intro to Numerical Analysis II	4	MATH 5610
ME EN 5000	Engineering Law and Contracts	3	Major Status
ME EN 5050	Fund. of Micromachining Processes	3	Major Status
ME EN 5055	Microsystem Design & Characterization	3	Major Status
ME EN 5250	Programming for Interactive Systems	3	CS 1000 or 1001 or CH EN 1703
ME EN 5620	Fundamentals of Microscale Eng	3	Major Status
MET E 5260	Physical Metallurgy I	3	
MET E 5690	Process Eng Statistics	2	MATH 3070
MGT 3000	Principles of Management	3	
MGT 3680	Human Behavior in Organizations	3	
MGT 3800	Business Ethics	3	

MGT 3680	Human Behavior in Organizations	3	
MGT 4900	International Management	3	Fulfills IR
MGT 5510	Principles of Human Resource Management	3	
MKTG 4840	International Marketing	3	MKTG 3010 or 3011. Fulfills IR.
MSE 3061	Transport Phenomena in MSE	3	Major Status in ChE
MSE 3210	Electronic Properties of Solids	3	Major Status in ChE
MSE 3310	Introduction to Ceramics	3	
MSE 3410	Intro to Polymers	3	
MSE 5040	Intro to Modern Biomaterials	4	
MSE 5475	Introduction to Composites	3	
PHYS 2215	Physics Lab for Scientists & Eng. I	1	PHYS 2210
PHYS 2225	Physics Lab for Scientists & Eng. II	1	PHYS 2210 and 2215 *Both PHYS 2215 & 2225 can be used as substitute for PHYS 1809*
PHYS 3150	Energy and Sustainability: a Global Perspective	3	PHYS 2010 or 2020 or 2110 or 2120 and Math 1310. Fulfills International Requirement
PHYS 3610	Electronics for Instrumentation	3	PHYS 2220 and 2225
PHYS 3740	Intro. to Quantum Theory & Relativity	3	PHYS 2220, MATH 2250
PHYS 3760	Principles of Thermo. & Stat. Mech.	3	PHYS 2220, MATH 2250
PHYS 5510	Solid State Physics I	3	CHEM 3060 and PHYS 3740
POL S 3320	Intro. to Public Policy & Analysis	3	
POL S 5211	Constitutional Law	3	
POL S 5322	Environmental & Sustainability Policy	3	*May take POL S 5322 or CMP 5350, not both*

Table 4. List of Approved Courses for Technical Electives by Area

Area	Recommended Courses	Additional Approved Courses
Process Control	CH EN 5203	CH EN 4973, 4975, 4977, 4978 PHYS 2215, 2225, 3610

		MATH 3070, 3080, 5600
Emphasis in Energy Engineering	CH EN 5151, 5153, 5305, 5307, 5310	CH EN 4973, 4975, 4977, 4978, 5203 plus supporting classes for Emphasis in Energy Engineering
Applied Mathematics and Physical Sciences	BIOL 2020 CH EN 5810 CHEM 2315, 2320, 2325, 3100, 5720, 5730 PHYS 3610, 3740, 3760	CH EN 4973, 4975, 4977, 4978, 5203 MATH 3070, 3080, 3090, 5620
Biochemical Engineering and Living Systems	BIOL 2020, CH EN 5810	BIOL 2030, 3510, 3520 CHEM 2315, 2320, 2325, 3100, 3090 CH EN 4973, 4975, 4977, 4978 MSE 5040 PHYS 3610
Environmental Engineering	CH EN 5305, 5307, 5310	ATMOS 5000 BIOL 2020 CH EN 4973, 4975, 4977, 4978 CVEEN 3610, 5605 GEO 5350 MATH 3070 PHYS 3610
Management, Policy, and Law	CH EN 5305, 5307, 5310	CH EN 4973, 4975, 4977, 4978 ECON 3500 ENTP 3700, 4560, 5770, 5780 MATH 3070 ME EN 5000 MGT 3000, 3680, 3800, 4900, 5510 MKTG 4840 PHYS 3610 POL S 3320, 5211, 5322* CMP 5360, 5350*
Materials and Nuclear	MSE 3210, 3410 NUCL 3000, 3100, 3200, 4000	CH EN 4973, 4975, 4977, 4978, 5655 MATH 3070 MET E 5260 MSE 3061, 3210, 3310, 3410, 5040, 5475 PHYS 3610, 3620
Silicon Chip Processing	CH EN 5205 (Smart Systems)	ME EN 5050. 5055, 5620, MET E 5690, PHYS 5510
Data Science for Engineers	CH EN 5205 (Smart Systems)	CS 1410, 3200; MATH 3070, 3080, 3170, 3180; ME EN 5250; MET E 5690

* Students may take one of POL S 5322 or CMP 5350, not both.

Table 5. Specializations for Technical Electives.

Applied Math and Physical Sciences: The Applied Mathematics and Physical Sciences option is intended to provide students with deep understanding in fundamental sciences; mathematics, physics, chemistry and biology. Students intending to pursue graduate school options may want to consider courses in mathematics to buildup their applied mathematics background. Students wanting to go to medical school may want to consider additional courses in biology and biological chemistry. Students wanting to complete the science and math series required of them in the basic curriculum may also choose this area.
Biochemical Engineering and Living Systems: With recent developments in biotechnology and genetics, it is apparent that chemical engineers will be needed in the future to design and develop systems that will produce biochemical/biomedical products more efficiently and economically. The objective of this emphasis area is to give the student an opportunity to learn more about biological systems and how chemical engineering principles are applied in biotechnology. Applications range from the biomedical field to bioprocessing to bioremediation. The required course, CH EN 5103, gives the student an introduction to biochemical engineering. The Projects Labs, 4903 and 4905, include projects where the student will perform biological and biochemical experiments. Biology 2020 is strongly recommended to provide background on cell structure and other biological basics and is a prerequisite to CH EN 5103.
Environmental Engineering: The courses listed for this area were selected for students with a strong interest in the environmental area. The courses are designed to give the student more, in depth, information on the wide-range of environmental subjects. Topics covered include environmental aspects of fuels, air pollution, bioremediation, groundwater flow as well as introductory courses in environmental engineering.
Energy Engineering: Three of the major challenges facing humanity are limitations in the supplies of food, water, and energy. The emphasis in energy engineering is meant to give undergraduates in Chemical Engineering a suite of technical electives that will equip them with the engineering and professional skills required to address the need for clean and secure energy. Environmental protection, energy use, and energy production are included in the emphasis. The emphasis will appear on students' transcripts.
Management, Policy, and Law: Engineers frequently encounter challenges in scientific, legal, administrative, and public policy areas. The logical problem solving skills inherent in engineering lend themselves to good approaches to management, policy, and law. This option allows the student to build the skills necessary to develop and manage their own projects. Specifically, this

curriculum includes course work in strategic planning, statistical quality control, and financial modeling. The suggested curriculum also includes classes that explore public policy, law, and the allocation of human resources. Engineering students who complete this option will enter their first job knowing that it takes more than just science and mathematics to complete successfully any project.
Materials and Nuclear: The Materials and Nuclear option provides students interested in engineering and/or nuclear materials an opportunity to explore these important areas of chemical engineering. Courses expose students to the fundamentals of materials properties as well as engineering application of materials, including metals, ceramics, polymers, electronic, and composite materials. Emphasis is placed on chemical engineering aspects of materials processing as well as materials properties and selection for applications in chemical engineering. A minor in Nuclear Engineering is available; see http://www.nuclear.utah.edu/minor.html.
Process Control: Today, process engineers have software and hardware capabilities to implement multivariable model-based control, and to build accurate empirical and semi-empirical models, perform process optimization, fault detection, process monitoring, etc. The limiting factor in a wide-spread application of the advanced process control and data analysis methods is the limited set of skills obtained by chemical engineering within the traditional chemical engineering education. This emphasis area is aimed at developing a guideline on the sequence of elective classes for the students who wish to obtain a more in-depth knowledge of Process Control and related fields.
Si-chip Processing The silicon processing industry seeks graduates who have a basic understanding of photolithography, silicon etching, thin film deposition and etching, statistical design of experiments, and solid-state physics.
Data Science The preparation of graduates for the future should include data science. Data science includes three components: computing, statistics, and knowledge of relevant physical processes. The later is provided by the requirements of the standard chemical engineering curriculum.

Fundamentals of Engineering (FE) Exam

All chemical engineering students must take the Fundamentals of Engineering (FE) CHEMICAL CBT Exam in order to graduate. The FE is developed and administered by the NCEES (National Council of Examiners for Engineering and Surveying). NCEES provides special testing accommodations for people with disabilities or religious convictions that preclude testing on Saturdays. More information on the exam and accommodations can be found at http://www.ncees.org.

The exam is administered by the State and is nationally composed and graded. The exam is given throughout the year and should be taken at the earliest possible date in the senior year or at the end of the junior year. The College and the Department usually conduct a "Fundamentals of Engineering Review Series" of lectures during fall and spring semesters. Recorded review lectures are available on the Chemical Engineering and College of Engineering websites.

If a student does not pass the FE on their first attempt, then they are required to take a one-half-credit Chemical FE Review course (CH EN 4850) and retake the FE a second time after completing the review. Students who do not pass the FE after two attempts will still be allowed to graduate but in order to be cleared for graduation they must submit to the Undergraduate advisor the two pdf files provide by NCEES to show that they have attempted the exam twice. Students who pass the FE exam after one or two attempts must also submit, to the UG Advisor, the report provided by NCEES, to show that they have passed the Chemical CBT Exam before they can be cleared for graduation.

VI. Advanced Placement (AP) Credit

Students who take Advanced Placement (AP) courses in high school may receive college credit for certain University courses if they receive a certain minimum score on the AP exam. However the department will only accept credit that appears on your University of Utah transcript showing the tests taken and the test scores. The table on page 22 outlines placement in chemistry, math, and physics as determined by those departments. For more information on placement, see the General Catalog (http://www.ugs.utah.edu/catalog/) pages for Chemistry, Math, and Physics. The table below assigns a grade for each score and these are used in Chemical Engineering to determine your GPA for admission to major status. If, for any reason, you decide to take a class for which you have received AP credit, we will use the grade you received in that class instead of the equivalent AP grade.

Advanced Placement Credit Information for Chemical Engineering students

Subject/AP Score	Placement as determined by relevant department
Chemistry	
5	CHEM 2310[1]
4	CHEM 1220
Calculus[2, 3]	
5(AB)	MATH 1310 or 1311
4(AB)	MATH 1310 or 1311
3 (AB)	MATH 1310
5(BC)	MATH 1320 or 1321
4(BC)	MATH 1320 or 1321
3(BC)	MATH 1320
Physics B/Physics 1&2	
3, 4, or 5	PHYS 2210
Physics C (Mech/E & M)	
4 or 5	PHYS 3210

1. Only the chemistry courses, CHEM 1210, 1220 are waived. Students must still take the corresponding laboratory associated with these courses, CHEM 1215 and 1225, unless they have already taken the equivalent AP chemistry laboratories in the Chemistry department at the University of Utah or elsewhere. High school lab notebooks, if examined by the undergraduate advisor in Chemistry, can be used to determine lab equivalency.
2. If you have not taken a math course recently, you may want to take MATH 15, a Precalculus Review. A strong foundation in math is necessary for many engineering courses.
3. Math 1210, 1250, 1310, 1311 or 1270 is a prerequisite to Physics 2210.

VII. Honors in Engineering Program

The Honors in Engineering Program in the College of Engineering is designed to provide a challenging, individualized educational experience to high achieving students and to promote life-long learning throughout their careers. The objective is to challenge top students by offering them access to more advanced levels of study, to facilitate the fullest possible use of their creative abilities, to encourage a sustained interest in advanced education and basic research, as well as to foster leadership and fellowship within the engineering community. Honors in Engineering is an undergraduate student honors program that is an option and not mandatory. Students can also receive Departmental Honors and/or University Honors in addition to Honors in Engineering.

For more information, including requirements and admission criteria, please refer to http://www.coe.utah.edu.

VIII. Transfer Students

Students planning to transfer to the department from other colleges and universities should contact the transfer student adviser, Prof. Geoff Silcox, 3290 MEB, 801-581-8820, geoff@chemeng.utah.edu.

Transfer students who wish to be admitted to major status and register for courses in Chemical Engineering, and who did not graduate from a State of Utah institution, must complete a Transfer Agreement (http://www.che.utah.edu/~geoff/transfer_agre.xls) and meet with an advisor. The advisor must approve the transfer credit by signing the Transfer Agreement. The transfer agreement is not required of students whose credit is all from a state of Utah institution.

Transfer students may apply for major status by completing the application found at http://www.che.utah.edu/undergraduate/forms.

IX. CO-OP Program

The Cooperative Education Program (Co-op) seeks to provide students with practical experience to complement class-oriented learning. The industrial exposure that participants obtain is beneficial to students who hope to work in industry. In many cases, co-op experiences will occur at locations removed from campus with a strong possibility of being out of state. These opportunities are available with employers who have agreed to participate with the University of Utah.

Participants have generally completed (or will shortly complete) their sophomore-level courses and are selected by potential employers from a pool of applicants. The process of recruitment, interviewing, and selection is typically handled by Career Services. All University of Utah students have a U Career Path account set up for them in Campus Information System. Students may post their resumes and receive information on available jobs and internships through U Career Path. For deadlines, procedures, and help with your resume, please see http://careers.utah.edu/.

Once employed in a co-op, students request admittance into CH EN 4977 or 4978. The former, 4977, may be used for up to 3 units of departmental technical elective credit. The latter, 4978, may count for up to 3 units of non-departmental technical elective credit. Students working part-time for an engineering employer during a semester may also apply for admittance to CH EN

4977 or 4978, and receive from 1 to 3 hours credit for their work experience. To receive credit, the student will be required to produce a 15-20 page report each time they register for CH EN 4977 or 4978. The report will describe the engineering activities and work performed, and must meet acceptable academic standards of grammar and detail.

Participation in some co-op Programs will alter the suggested departmental program of study. Students may alternate semesters between engineering employment and on-campus study. Co-op participants must commit to their employer and to the department, that they will fulfill their employment obligations and complete full-time study while on-campus *without outside employment*. All students return to the University campus full time for their senior-level courses.

For info on internship opportunities, make sure your U Career Path profile is updated, and contact Career Services (http://careers.utah.edu/). For current co-op opportunities, contact Dr. Terry Ring (ring@eng.utah.edu, 801-585-5705). Co-op opportunities are also posted on the Chemical Engineering website as they arise.

If you will be missing a semester or more of classes due to co-op, please speak with Megan Mcallister, Academic Advisor (megan.mcallister@utah.edu, 585-7175) or Geoff Silcox, Associate Chair (geoff@chemeng.utah.edu, 581-8820) before the semester begins.

X. Policy on Repeating Courses

When a College of Engineering class is taken more than once, only the grade for the second attempt is counted. Grades of W, I, or V on a student's record count as having taken the class. Chemical Engineering also enforces these guidelines for mathematics and science courses. After two unsuccessful attempts of any required math, science or engineering course, students will be dismissed from the Chemical Engineering Major. Please contact Megan Mcallister or Geoff Silcox if you plan to repeat a course more than once.

XI. Departmental Scholarships

The Department has a number of scholarships that are available to undergraduate students (http://www.che.utah.edu/, undergraduate page, scholarships). Application forms are available on the website. The department offers many scholarships for incoming and continuing students that are available from funds raised from industry or our alumni. In addition, there are a wide variety of University scholarships that are also available to incoming Chemical Engineering students from the Financial Aid & Scholarship Office, such as the Presidential or Honors-at-Entrance scholarships. Contact the Financial Aid & Scholarship Office, 105 SSB, 581-6211, for more information and application forms. The College of Engineering has a number of scholarships that are available to Chemical Engineering students; they can be contacted at 581-6911 or http://www.coe.utah.edu.

A number of loans are available through the College of Engineering.

XII. LEAP and E-LEAP Programs

Engineering-LEAP (E-LEAP) is a year long, small class called a "seminar," focusing on the theme of community building in American and in global settings, and the ethical standards of engineering. This seminar keeps students together with one professor and classmates, while fulfilling the University's diversity requirement and two general education requirements—one in

Humanities and one in Social Science. In the first semester, students engage in a discussion about the American community experience as revealed through American autobiography and fiction. In the second semester, students build on the first semester concepts to consider the role of the engineer as a technical expert in contributing to community decision-making. In addition to its academic content, E-LEAP seminar emphasizes college writing, critical reading, group work, presentation skills, and library research strategies appropriate for engineering majors. Throughout the year, students network with College of Engineering faculty and advisors as well as the LEAP professor and a student advisor to learn more about careers in engineering. They also attend lectures and events about innovations in the engineering field. For more information contact the LEAP office at (801) 581-3811.

XIII. Student Organizations

While your course work should be your top priority, participating in various student organizations and activities on campus can enhance your education at the University of Utah. This will enable you to interact with your colleagues outside of class and in an informal manner as well as acquaint you with all the supporting services the University and the College has to offer. The following table lists a few of the U of U student chapters you may want to consider.

Organization	Location, Tel. Number	Contact
American Institute of Chemical Engineers (AIChE)	3220 MEB 801-587-8461	Prof. Tony Butterfield
Society of Women Engineers (SWE)	1620 WEB 801-581-4683	Ms. April Vrtis
Society of Hispanic Professional Engineers (SHPE)	1620 WEB 801-581-4683	Ms. April Vrtis
Program for Diversity in Engineering (PDE)	1620 WEB 801-581-4683	Ms. April Vrtis
American Indian Science and Engineering Society (AISES) -	1620 WEB 801-581-4683	Ms. April Vrtis
Society of Ethnic Student Engineers(SESE)	1620 WEB 801-581-4683	Ms. April Vrtis
Women in ChemE Peer Mentors Program	3290B MEB 801-585-7175	Ms. Megan McAllister and Cynthia Ruiz
Chemical Engineering K-12 Outreach Team	3226 MEB 801-587-8461	Prof. Tony Butterfield

XIV. Policy on Prerequisites

Students who do not meet the prerequisites for a Chemical Engineering course must submit a class permission code request through the Chemical Engineering website, www.che.utah.edu. Links to websites to request permission codes for all University of Utah departments are found at http://registrar.utah.edu/register/permission-numbers-requests.php.

XV. Combined BS/MS Program

The Department offers a combined BS/MS degree programs for undergraduate students interested in research and a deeper study of the fundamentals of chemical engineering. This program is designed to foster undergraduate research and to accelerate progress toward the Master of Science degree. Students in the combined program should begin their research while in the undergraduate portion of the program and may expect to complete the combined degree after five years with the simultaneous conferral of the Bachelor of Science and Master of Science degrees. This is one year less than a traditional sequential BS - MS program as described in the General Catalog. The BS degree portion of the combined degree requires the completion of 121 semester credit hours; however, the University of Utah requires a minimum of 122 for a BS degree and it is up to the candidate to ensure that they have met this requirment. The MS degree requires the completion of 30 additional hours. The standard BS degree requires 127 hours. Because the BS and MS degrees are conferred at the same time, the BS/MS program is not open to international students since the Form I-20 does not permit two concurrent careers.

Students are encouraged to begin research in the summer following their junior year and often receive financial support. Most BS/MS students are also eligible for the University of Utah Tuition Benefit Program, once they are classified as graduate students.

The shift from undergraduate to graduate status occurs after completion of required undergraduate Chemical Engineering classes. Students wishing to exit the combined program can apply qualifying coursework toward the traditional BS and MS degree requirements without penalty. No student will be awarded a separate MS degree without satisfying all requirements for the BS degree.

SUGGESTED COMBINED BS/MS PROGRAM IN CHEMICAL ENGINEERING

FIRST YEAR

FALL SEMESTER	SPRING SEMESTER	SUMMER SEMESTER
MATH 1310 or 1311 Calculus I[1] (4)	MATH 1320 or 1321 Calculus II[1] (4)	
CHEM 1210 General Chem I (4)	CHEM 1220 General Chem II[2] (4)	
CHEM 1215 Gen Chem Lab I (1)	CHEM 1225 Gen Chem Lab II (1)	
WRTG 2010 Intermed Writing (3)	PHYS 2210 Phycs Scien Eng I (4)	
CH EN 1703 Intro to Chem Eng (2)	CH EN 1705 Chem Eng Des & Innov[3] (3)	
Gen Ed/Bachelor Req (3)	CH EN 4755 UG Seminar (0.5)	
TOTAL HOURS: 17	TOTAL HOURS: 16.5	

SECOND YEAR

FALL SEMESTER	SPRING SEMESTER	SUMMER SEMESTER
MATH 2250 DEs and LA (4)	MATH 3140 Vector Calc, PDE's for Eng (4)	
PHYS 2220 Phycs Scien Eng II (4)	CH EN 2800 Process Eng (3)	
CH EN 2450 Numerical Meth (2)	CHEM 2310 Organic Chem I[4] (4)	
CH EN 2300 Thermodynamics I (2)	Gen Ed/Bachelor Req (3)	
CH EN 4755 UG Seminar (0.5)	Technical Elective (3)	
Gen Ed/Bachelor Req (3)		
TOTAL HOURS: 15.5	TOTAL HOURS: 17	

THIRD YEAR

FALL SEMESTER	SPRING SEMESTER	SUMMER SEMESTER
CHEM 3060 Quantum Chem (4)	CH EN 3253 Chemical Process Safety (3)	Students are encouraged to begin working on Master's Thesis Research.
CH EN 3353 Fluid Mechanics (3)	CH EN 3255 Communication & Safety (1)	
CH EN 3453 Heat Transfer (3)	CH EN 3603 Mass Transfer and Sep (3)	
CH EN 3853 Chem Eng Thermo (3)	CH EN 3553 Chemical Reaction Eng (3)	
CH EN 4753 UG Seminar (0.5)	CH EN 5103 Biochemical Eng (3)	
	Gen Ed/Bachelor Req (3)	
TOTAL HOURS: 13.5	TOTAL HOURS: 16	

FOURTH YEAR

FALL SEMESTER	SPRING SEMESTER	SUMMER SEMESTER
CH EN 4903 Projects Lab I (4)	CH EN 4905 Projects Lab II[6] (3)	CH EN 6973 Thesis Research: Master's (3) [7]
CH EN 4253 Process Design I (3)	CH EN 5253 Process Design II (3)	

CH EN 4203 Process Control (3)	Technical Elective[5] (6)
CH EN 4753 UG Seminar (0.5) or CH EN 4850 FE Review (0.5)	
Gen Ed/Bachelor Req (3)	TOTAL HOURS: 12
TOTAL HOURS: 13.5	

TOTAL UNDERGRAD HOURS: 121+

FIFTH YEAR

FALL SEMESTER	SPRING SEMESTER	SUMMER SEMESTER
CH EN 6353 Fluid Mechanics (3)	CH EN 6553 Chemical Reaction Eng (3)	CH EN 6973 Thesis Research: Master's (3)
CH EN 6853 Thermodynamics (3)	CH EN 6603 Multicom Mass Transfer (3)	
Technical Electives (6) [8]	Technical Elective (3) [8]	
CH EN 7857 Grad Seminar (0.5)	CH EN 7859 Grad Seminar (0.5)	
	CH EN 6973 Thesis Research: Master's (2)	
TOTAL HOURS: 12.5	TOTAL HOURS: 11.5	

TOTAL GRADUATE HOURS: 30

1. Students with adequate math preparation may wish to take the MATH 1311 and 1321, Accelerated Engineering Calculus series, in place of MATH 1310 and 1320.

2. Students who qualify may wish to take CHEM 1221, Honors General Chemistry II and CHEM 1241, Honors General Chemistry Lab II, instead of CHEM 1220, General Chemistry II, and CHEM 1225, General Chem Lab II.

3. CH EN 1705 is a required course that was first offered spring semester 2013. Transfer students are encouraged to complete 1705. If they do not, they are required to replace it with PHYS 1809 (Elementary General Physics Laboratory) and CHEM 2315 (Organic Chemistry Lab I). Note that PHYS 1809 can be replaced by PHYS 2215 and 2225 (Physics Laboratory for Scientists and Engineers I & II). A transfer student is defined as someone who has completed 2/3 of their first-year requirements at another school.

4. Students who qualify may wish to take CHEM 2311, Honors Organic Chemistry I, instead of CHEM 2310.

5. A total of 9 credit hours of technical elective courses are required and at least 3 must be in approved CH EN or NUCL courses.

6. CH EN 4905 fulfills the Upper-division Writing/Communication requirement.

7. Students who are admitted to the Graduate School for the MS portion of the BS/MS are not eligible for the tuition benefit program during their first summer semester.

8. BS/MS students may take their graduate electives earlier in their program of study, if their schedule permits it.

APPLICATION / ADMISSION PROCEDURES

Undergraduate students must complete their preliminary application to the combined BS/MS program by May 1st of the year in which they are enrolled in CH EN 3603, Mass Transfer and Separations. An undergraduate GPA of at least 3.3, based on all undergraduate work or work

completed during the last two years of study, whichever is higher, is required. Students must be supported by a faculty member who will be their research advisor for a master's thesis. The faculty member must be able to support the student as a Research Assistant for the graduate portion of this program.

Applicants who do not qualify for the BS/MS program are encouraged to apply to the traditional MS program.

To begin the process for admission to the BS/MS program, submit the following three items by May 1:

1. A completed Chemical Engineering BS/MS application. This application can be found at http://www.che.utah.edu/. Please go to the undergraduate page and select Forms.
2. A letter of support from the faculty member who will be your research advisor for your master's thesis. The letter must include a commitment from the faculty member to support you as a Research Assistant for the graduate portion of this program.
3. A current Degree Audit Report (DARS).

Mail or deliver all materials to:

Megan McAllister, Academic Advisor

University of Utah Chemical Engineering Department

50 S Central Campus Drive RM 3290 MEB

Salt Lake City, Utah 84112-9203

Once given preliminary approval, based on the above three items, the student will need to submit a BS/MS program of study, take the GRE, and complete an application for admission to the Graduate School. Students should apply to the Graduate School by 1 February. This will ensure admission for the summer semester following the semester in which the student completes Projects Lab II and Process Design II. Students must comply with Admissions Office deadlines. Seniors need to plan on taking the GRE at least a few weeks before the 1 February deadline.

Admitted students must follow all guidelines for the Masters of Science program that are listed within the Graduate Handbook.

Students who are admitted to the Graduate School for the MS portion of the BS/MS are not eligible for the tuition benefit program during their first summer semester.

XVI. Undergraduate Research Scholar Designation

The designation, Undergraduate Research Scholar (URSD), appears in the awards section of the transcripts of graduating students. The following requirements are part of the URSD. More information is available at http://ursd.utah.edu/.

- A student must complete two semesters of research with a faculty mentor.
- A student must participate as a presenter in a campus - wide U of U, state undergraduate research symposium, National Conference on Undergraduate Research or a professional conference.

- A student must publish their work in the U of U Undergraduate Research Abstracts journal, other campus research publication, national, regional or state conference program or proceedings or other professional journal.

Academic credit for doing research may be earned by registering for CH EN 4973 (Undergraduate Thesis), CH EN 4980 (Undergraduate Research), and CH EN 4999 (Honors Thesis). Note that 4980 can be taken twice for a total of six units.

XVII. Undergraduate Courses offered in the Department (CH EN)

A complete list of Chemical Engineering course offerings is available in the online General Catalog. As with all engineering courses, the prerequisites for each class must be completed by the time of registration. The minimum acceptable grade in required CH EN courses is C.

XVIII. Logging in Remotely to the Department Server

The Department of Chemical Engineering allows students to connect remotely to its computing labs, the ICC and the Starley Lab. For information on how to do this, please see http://bitly.com/YYaPlf.